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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/594,243 | 09/25/2006 | Christian Walsdorff | 296729US0PCT | 2192 |

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| EXAMINER | |
|---|---|
| NGUYEN, NGOC YEN M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1734 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 04/01/2011 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/594,243 | WALSDORFF ET AL. | |
| | **Examiner** | **Art Unit** | |
| | Ngoc-Yen M. Nguyen | 1734 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 August 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *10 and 13-26* is/are pending in the application.

4a) Of the above claim(s) *18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10, 13-17, 19-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10, 13-17, 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hibi et al (2002/0172640) in view of Iaccino et al (2008/0047872) and Shirk (3,482,946).

Hibi ‘640 discloses a process of producing chlorine by oxidizing hydrogen chloride with oxygen using a supported ruthenium oxide catalyst (note claim 1). The support can be titanium oxide, alumina, zirconium oxide, etc. (note claim 4). This process is well known in the art as a Deacon process and the reaction is well known to be an exothermic reaction.

Hibi ‘640 further teaches that the catalyst can be used in a reactor such as fixed bed reactor, fluidized bed reactor, etc. with the fluidized bed has an advantage that the temperature distribution width in the reactor can be reduced because heat in the reactor can be sufficiently removed (note paragraph [0067]-[0068]).

The difference is Hibi ‘640 does not disclose that the temperature within the fluidized bed decreases from an absolute temperature maximum along the flow direction to the surface of the fluidized bed.

Iaccino '872 teaches that for an exothermic reaction, it may be carried in multiple catalyst beds with heat removal between beds. In addition, the lead bed(s) may be operated at higher temperatures to maximize kinetic rates and the tail bed(s) may be operated at lower temperatures to maximize thermodynamic conversion (note paragraph [0098]).

It would have been obvious to one of ordinary skill in the art to optimize the temperature difference between the lead bed and the tail bed to maximize both the kinetic rate and the thermodynamic conversion for the process of Hibi '640.

Shirk '946 is applied to teach a reactor for effecting contact between vaporous reactants and fluidized (note claim 1) finely divided solids in which an upright, elongate reaction zone is compartmented. Means are provided to introduce gasiform fluids into the lower end of the reactor and to remove gasiform fluid, free of solids, from the upper end of the reactor. Temperature control means is provided within each compartment to that the mixture of vapors and fluidized solids moving freely within and between compartments may have independent temperature adjustment within each compartment (note abstract). Shirk '946 further teaches that the reactor design provides an excellent means of maintaining the desired operating temperature within about 3°F, assuring the removal of the exothermic heat of reaction (note column 4, lines 47-51).

As shown in Figure 1 of Shirk '946, the bed can be divided into multiple zones. The bottom perforated tray as shown in Figure 1 is considered as the claimed "gas distributor". It would have been obvious to one of ordinary skill in the art to optimize the process conditions in Shirk '946, such as superficial gas velocity, the shape of the

opening for the perforated plate, etc. in order to obtain the desired temperature in the fluidized bed.

For the combined teaching of the references, at the start of the process, the reactants would need to be heated to a temperature at which the reaction would occur and the reaction temperature would increase quickly because it is an exothermic reaction to reach the absolute temperature maximum (the desired or required reaction temperature). At this temperature maximum, as suggested by Iaccino '872, the kinetic rates can be maximized. However, in order to maximize the thermodynamic conversion, the temperature needs to be lowered, also as suggested by Iaccino '872. Since the decrease in temperature is carried over multiple catalyst beds (or zones), the distance between the absolute temperature maximum and the gas distributor (i.e., the distance it takes to increase the temperature to the absolute maximum) would naturally be smaller than the distance between the absolute temperature maximum and the surface of the fluidized bed (i.e., the distance it takes to decrease the reaction temperature to maximize thermodynamic conversion). In any event, it would have been obvious to one of ordinary skill in the art to optimize the rate of heating (thereby the distance it takes to accomplish the heating) and the rate of cooling to lower the temperature (thereby the distance it takes to accomplish the cooling) in the combined teaching to maximize not only kinetic rates but also thermodynamic conversion for the exothermic process of produce chlorine. It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry the exothermic reaction of producing chlorine as disclosed in Hibi '640 with higher temperature at the beginning of

the reaction (i.e. lead bed) and lower temperature at the end (tail bed), as suggested by Iaccino ‘872 in order to maximize both the kinetic rate and the thermodynamic conversion and to use a single fluidized bed reactor as suggested by Shirk ‘946 because this reactor is compartmented and each compartment can serve as a "bed" as suggested in Iaccino '872 and the temperature in each compartment can be controlled independently to obtain the higher and lower temperatures as desired by Iaccino '872.

Claims 10-17, 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hibi ‘640 in view of Degnan et al (5,573,657) and Shirk ‘946.

Hibi ‘640 is applied as stated above.

Degnan ‘657 is applied to teach that for an exothermic process, it is thermodynamically favored by lower temperatures but for kinetic reasons, moderately elevated temperatures (i.e. higher temperatures) are normally used (note column 1, lines 32-35).

Thus, it would have been obvious to one of ordinary skill in the art to maximize both the kinetic rate and the thermodynamic conversion for the process of Hibi ‘640 by operating the fluidized bed at two different temperatures, i.e. at a higher temperature for kinetic reasons, and lower temperature for thermodynamic reasons, as suggested by Degnan ‘657.

Shirk ‘946 is applied as stated above to teach that a fluidized bed can have multiple compartments and the temperatures in these compartments can be independently controlled.

Applicant's arguments filed August 4, 2010 have been fully considered but they are not persuasive.

Applicants argue that the instant claim 10 now requires the temperature difference of at least 10 K, the temperature within the fluidized bed decreases from an absolute temperature maximum along the flow direction to the surface of the fluidized bed and to the gas distributor and the distance between the absolute temperature maximum and the gas distributor is smaller than the distance between the absolute temperature maximum and the surface of the fluidized bed.

As stated in the above rejection, Iaccino '872 fairly suggests that the lead bed is operated at higher temperature to maximize kinetic rates and the tail bed is operated at lower temperature to maximize thermodynamic conversion; thus, it would have been obvious to one skilled in the art to optimize, through routine experimentation, the temperature in the lead and tail beds. For the distance between the absolute maximum temperature to the gas distributor or to surface of the fluidized bed, since the process of Hibi '640 is exothermic, it would generally take less time (thereby shorter distance) to increase the reaction temperature than to decrease the reaction temperature.

Applicants argue that Hibi '640 does not disclose that the temperature within the fluidized bed decreases from an absolute temperature maximum along the flow direction to the surface of the fluidized bed.

Hibi '640 is not relied upon to disclose such feature. Hibi '640 is applied to teach an exothermic process for producing chlorine by oxidizing hydrogen chloride in a fluidized bed.

Applicants argue that Iaccino does not disclose the distance between the absolute temperature maximum and the gas distributor is smaller than the distance between the absolute temperature maximum and the surface of the fluidized bed.

Again, as stated above, because the process being carried out in the fluidized bed is exothermic, it would take less time (thereby shorter distance) to increase the reaction temperature than to decrease the reaction temperature. Iaccino ‘872 also teaches that it is possible to use multiple “tail” beds, thus, the reaction temperature would be sequentially decreased in these beds and it would take longer and more distance to decrease the temperature through these tail beds.

Applicants argue that Shirk ‘946 does not disclose the distance between the absolute temperature maximum and the gas distributor is smaller than the distance between the absolute temperature maximum and the surface of the fluidized bed.

Shirk ‘946 is not relied to teach or suggest such limitation. Shirk ‘946 is applied to suggest multiple fluidized “beds” can be replaced by multiple “zones" in a single fluidized bed. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants argue that Degnan does not disclose that the distance between absolute temperature maximum and the gas distributor is smaller than the distance between the absolute temperature maximum and the surface of the fluidized bed.

Degnan teaches that for an exothermic process, it is thermodynamically favored by lower temperatures but for kinetic reasons, moderately elevated temperatures are normally used. It would have been obvious to one skilled in the art to optimize the temperature distribution (i.e. having two different temperatures) in the exothermic reaction of Hibi '640 for thermodynamic and kinetic reasons. It would have less time (thereby less distance) to increase the temperature in the exothermic reaction than to decrease the temperature.

Applicants argue that none of the applied prior art recognizes the temperature distribution leads to an improved space-time yield.

In the above rejection, both kinetic rate (faster rat) and thermodynamic conversion (higher conversion) are maximized for the process, the space-time yield of the combined teaching would inherently be improved.

Applicants argue that the advantage of the claimed invention is that the catalyst systems containing active components which are volatile at elevated temperatures, as ruthenium compounds, can be operated with better long-term stability.

It should be noted, except for claim17, Applicants' claims do not require the presence of any active components which are volatile. Furthermore, Applicants' claims do not require any duration for the process, so the "long-term stability" is not seen as an improvement.

Applicants argue that the claimed temperature distribution reduces capital costs.

Since the applied references fairly teach the temperature distribution, the reduction in capital costs would also be obtained for the combined teaching.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emily Le can be reached on (571) 272-0903. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1734

nmn
March 28, 2011